(12) UK Patent Application (19) GB (11) 2 376 913 (13) A

(43) Date of A Publication 31.12.2002

(21) Application No 0214312.1

(22) Date of Filing 20.06.2002

(30) Priority Data
(31) 10130548 (32) 25.06.2001 (33) DE

(51) INT CL[7]
B25G 1/01

(52) UK CL (Edition T)
B4K KSM
U1S S1642 S1647 S1648 S1649

(56) Documents Cited
GB 2297514 A
DE 004104917 A
US 5749421 A
WO 1995/021039 A1
DE 002804223 A

(58) Field of Search
UK CL (Edition T) B4K KSM
INT CL[7] B25F 5/02, B25G 1/01 1/02
Other: Online: EPODOC; WPI; PAJ

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(54) Abstract Title
Vibration isolated handle having restricted movement

(57) A damper 20, 22 vibration isolates a grip 10, 14, from a hand tool 18. The damper 20, 22 includes a bearing unit 28, 30 that guides the grip 10, 14, i.e., restricts relative movement between it and the tool 18. Preferably the bearing unit 28 includes a pin 36 about which the grip 10 can swivel, or a slide 40 and guide rail 38. Preferably the vibration isolator 20, 22 comprises one or more springs 46, 48. It is used as an additional handle in drilling and chisel hammers, straight back saws, and scrapers.

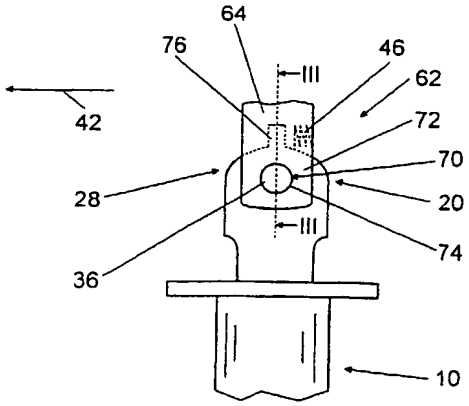

Fig. 2

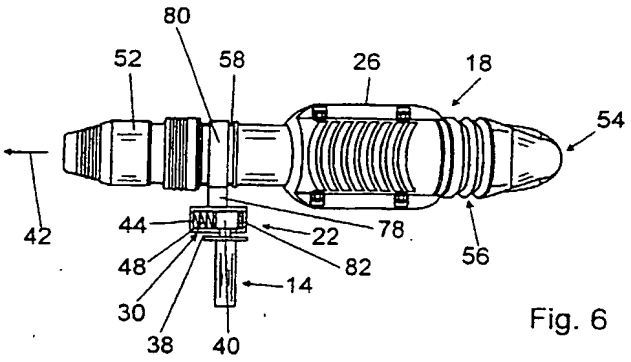

Fig. 6

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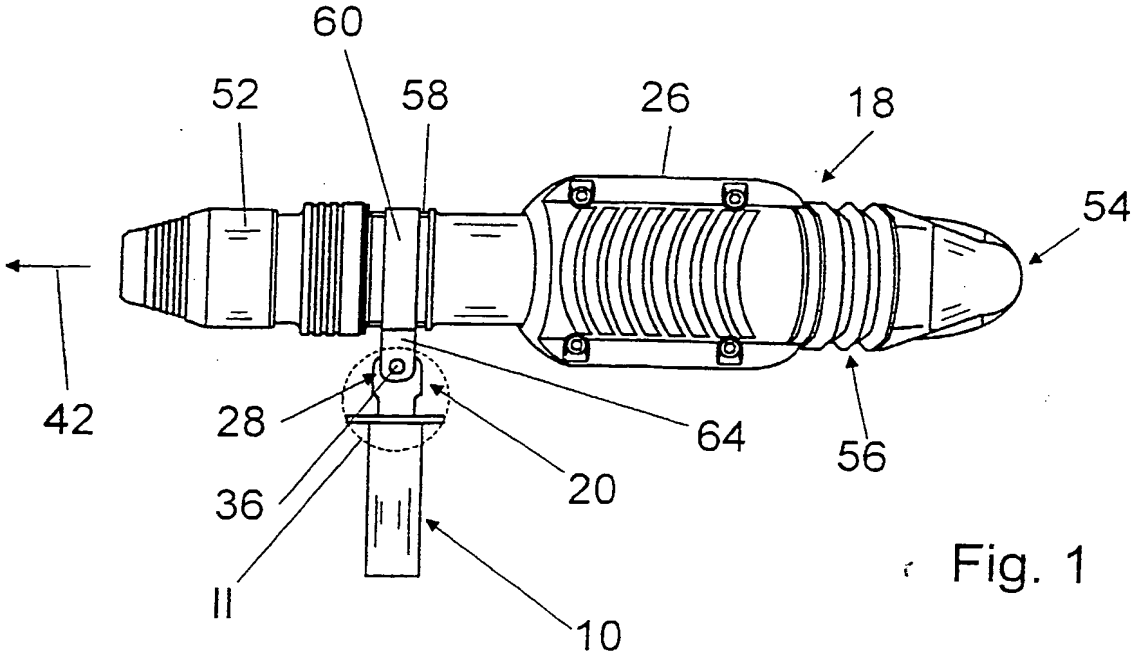
60
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26
18
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42
28
64
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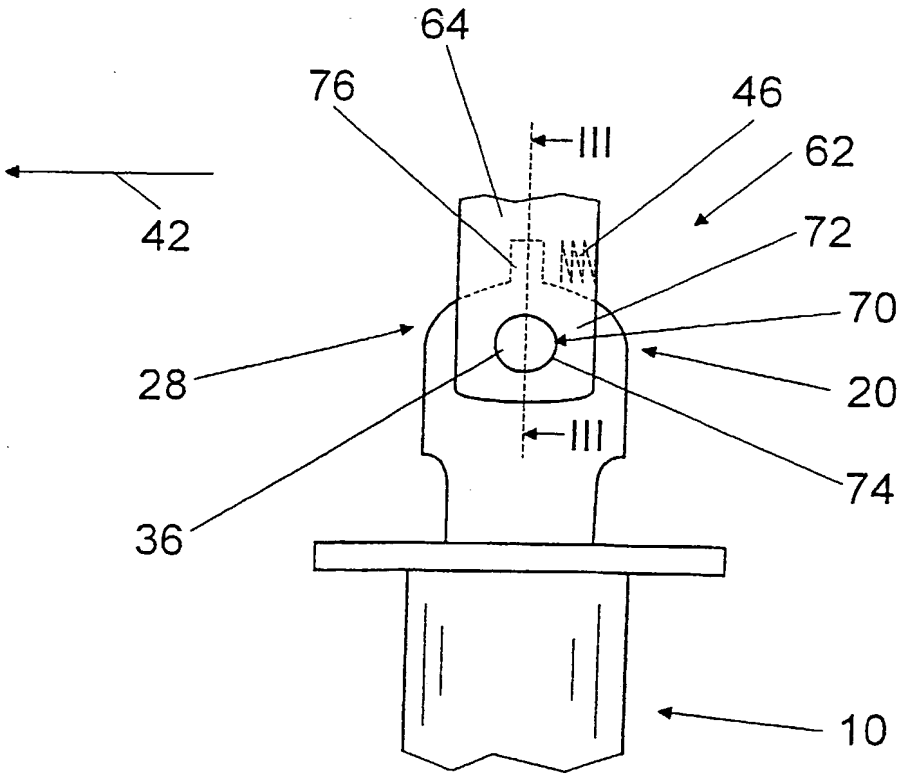
36
20
II
10

Fig. 1


64
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III
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Fig. 2

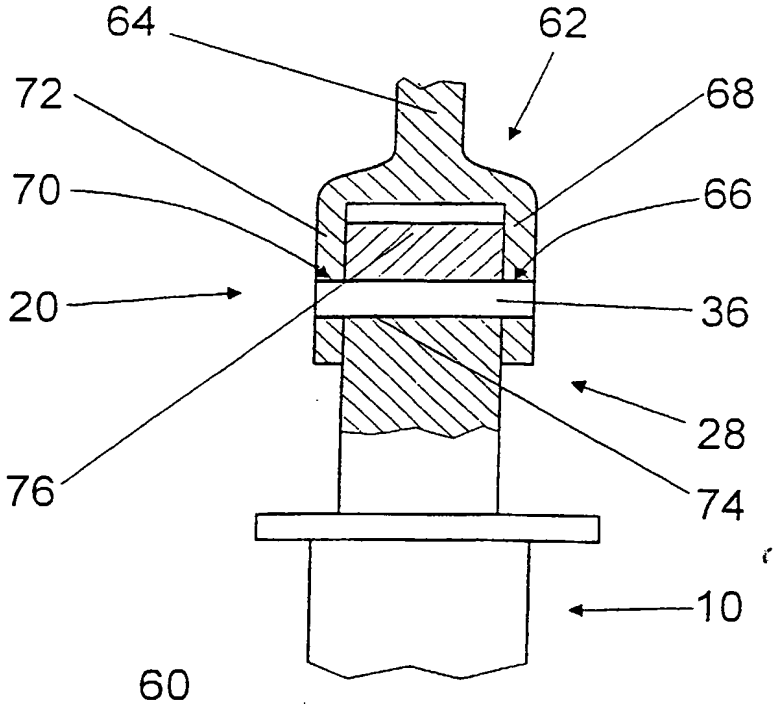


Fig. 3

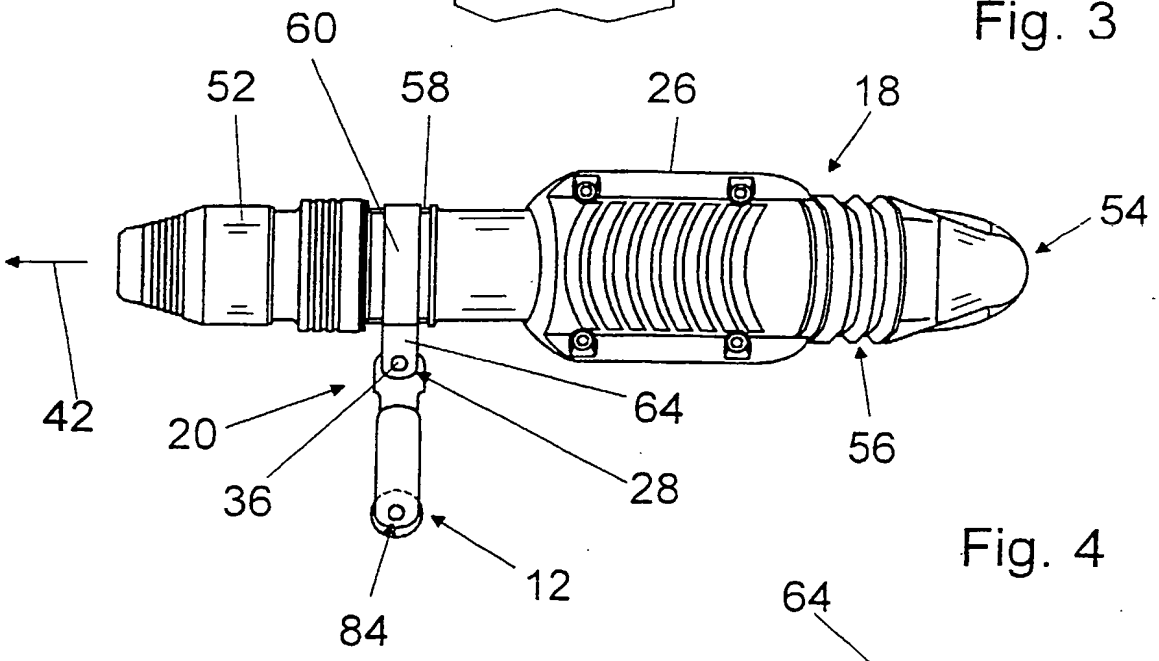


Fig. 4

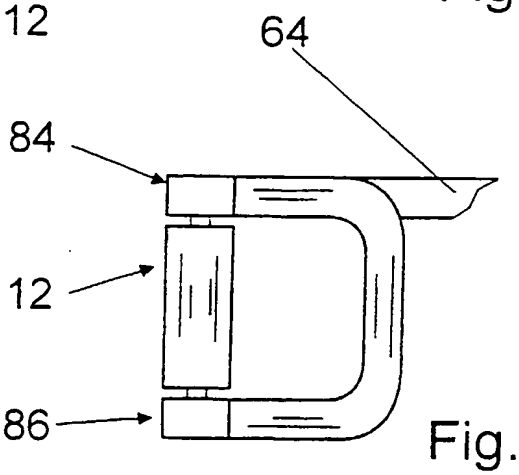
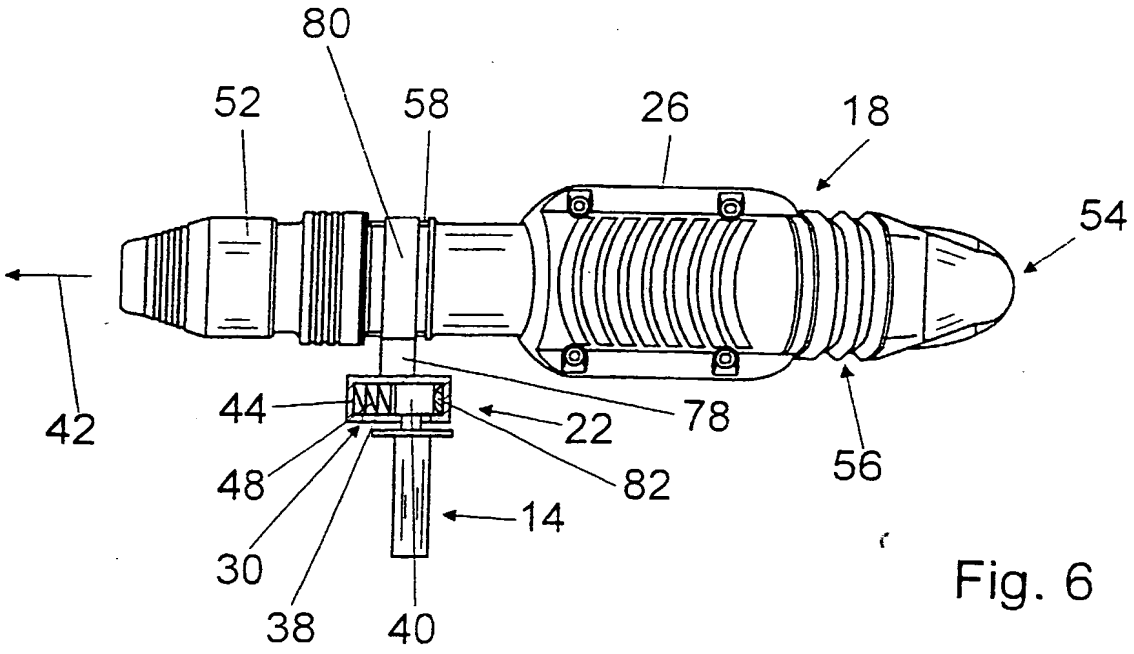


Fig. 5


80
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26
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42
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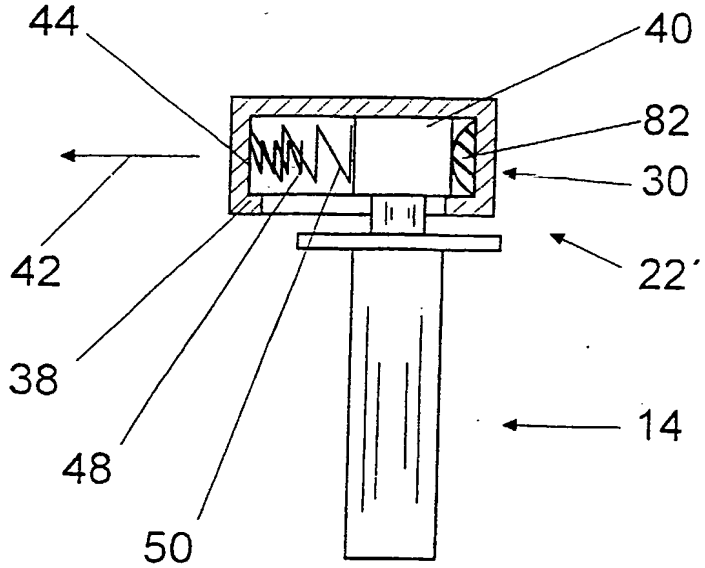
Fig. 6


44
40
82
30
42
22'
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50

Fig. 7

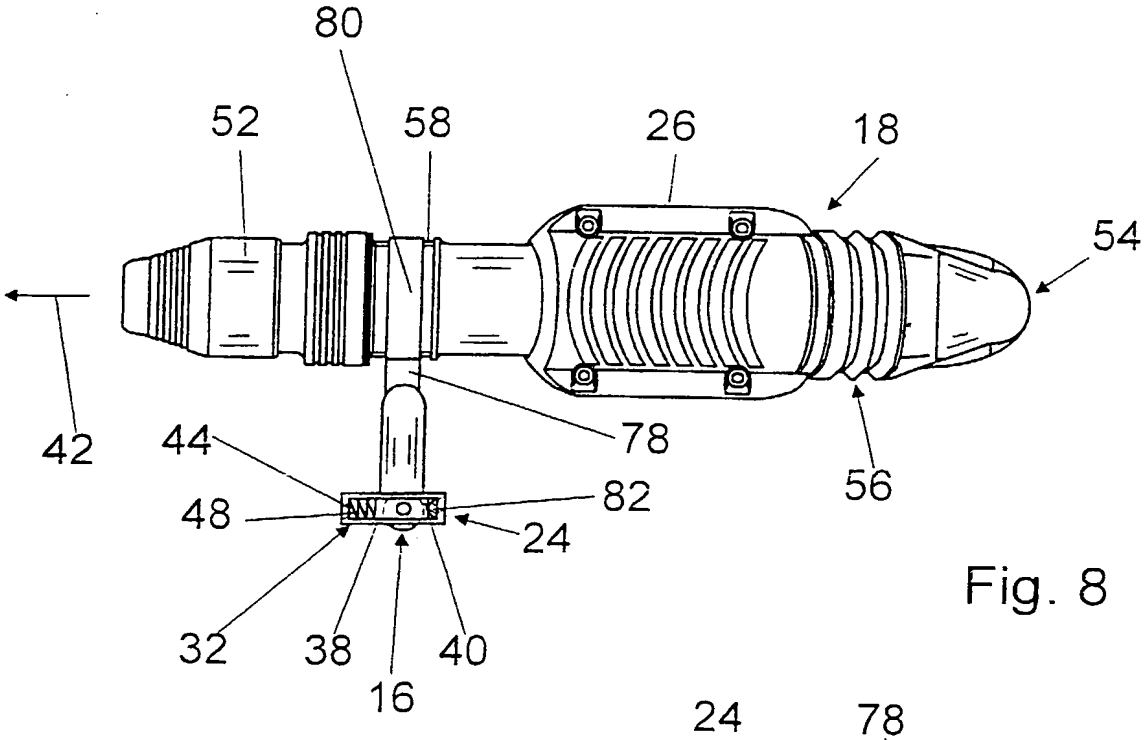
80
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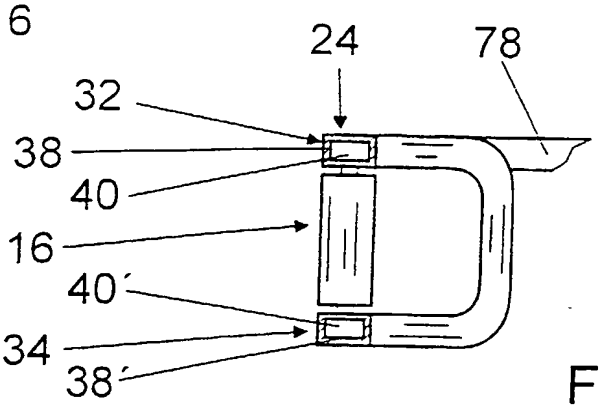
Fig. 8


24
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32
38
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16
40´
34
38´

Fig. 9

Additional handle

The invention relates to additional handles.

From DE 28 04 223 C1 a species-defining additional handle is known with a gripping element, which is connectable by an isolating apparatus to a housing of a hand tool machine, which effects in particular axial impacts. Supported in the gripping element formed by a sleeve is a threaded pin, which is screwable by its free end projecting from the gripping element into a recess of the housing of the hand tool machine. Introduced between the threaded pin and the gripping element is a rubber-elastic, isolating intermediate layer.

The invention proceeds from an additional handle for a hand tool machine having at least one gripping element, which is connectable by an isolating apparatus for vibration isolation to a housing of the hand tool machine.

It is proposed that the isolating apparatus comprises at least one bearing unit, by means of which the gripping element is guided in at least one direction. With the isolating apparatus according to the invention an advantageous vibration isolation of the gripping element in vibration direction and yet stable controlled guidance of the hand tool machine by the gripping element may be achieved.

When the bearing unit comprises at least one bearing pin, about which the gripping element is capable of swivelling, it is constructionally easy to achieve a compact bearing unit, in which advantageously a tendency of the gripping element to jam may be avoided. A swivelling angle up to a maximum of 25° proves ergonomically meaningful.

The isolating apparatus for vibration isolation of the gripping element advantageously further comprises at least one torsion spring. The torsion spring may be used as a bearing pin and be tensioned by the swivelling motion of the

gripping element. With few components a constructionally simple and space-saving isolating apparatus for vibration isolation is achievable. In principle, however, instead of torsion springs other spring elements and/or spring units deemed meaningful by the person skilled in the art, such as e.g. spring units having one or more helical compression springs, pneumatic springs, rubber sleeves etc., are also conceivable.

In a particularly advantageous manner the gripping element is supported so as to be rotatable about its longitudinal axis. A compensating movement in the wrist of the user may be avoided, and a pleasant way of working, which is gentle on the wrist, is achievable.

In a further development of the invention the gripping element is guided by the bearing unit in at least one direction in a translatory manner towards a spring element. A distance between a machining axis, in particular of a drilling and/or chisel hammer, and the gripping element as well as the alignment of the gripping element relative to the machining axis may advantageously be held constant. The hand tool machine is precisely guideable, and a movement in the wrist of the user during a work cycle may be avoided in particular by linear guidance of the gripping element and the comfort of the user may be enhanced.

The translatory guidance, in particular linear guidance, of the gripping element on the hand tool machine may be achieved in a constructionally simple manner in that the bearing unit for guiding the gripping element comprises at least one slide, which is guided in a guide rail. To prevent canting of the slide in the guide rail, the slide is to be equipped with a suitably large guide surface.

When the guide rail is externally sealed by means of at least one sealing element, an advantageous protection of the bearing unit and in particular of a spring element of the isolating apparatus against fouling by fine drilling dust during a drilling operation may be achieved. Should the spring element break during a

work cycle, an advantageous protection of the user may be achieved and parts, which are loose and/or break loose, may be intercepted by the sealing element.

The slide in the guide rail is advantageously restricted in machining direction by an end stop. In the event of breaking of the spring element during the work cycle, safe guidance of the hand tool machine may be guaranteed by the end stop. If the end stop is made of an isolating and/or damping material, then given abutment of the gripping element against the end stop, e.g. in special operating positions where an application force exceeds a spring force of the spring element, in the event of breaking of the spring element etc., an isolating and/or damping effect of the isolating apparatus may be maintained and the hand tool machine is still comfortably guideable.

When the gripping element is guided by the bearing unit in machining direction, then in hand tool machines, in which vibrations occur primarily in machining direction, such as e.g. in straight back saws, scrapers and particularly in drilling and/or chisel hammers etc., an advantageous vibration isolation and guidance may be achieved.

Advantageously, a bearing unit of the isolating apparatus is disposed in front of and behind the gripping element in longitudinal direction of the latter. Torques upon the bearing units and associated tendencies to jam may be avoided. However, other constructions deemed meaningful by the person skilled in the art are also conceivable for avoiding torques in the bearing unit of the isolating apparatus, such as e.g. a bearing unit lying in the load axis of the gripping element etc.

The isolating apparatus advantageously further comprises a helical compression spring. Helical compression springs may be manufactured inexpensively with low tolerances. When a main handle of the hand tool machine comprises an isolating apparatus with helical compression springs, it is possible simply to use

for the additional handle helical compression springs having the same isolating and/or damping properties as for the main handle.

When the isolating apparatus comprises spring elements acting in opposite directions, e.g. opposite, biased torsion springs, helical compression springs, pneumatic springs, rubber sleeves etc., it is easy to achieve an advantageous vibration isolation in two opposite directions. Even in the case of a low application force introduced by a user via the gripping element, a comfortable vibration isolation of the gripping element in two directions is achievable. What is more, the spring elements may be designed with different properties, in particular with different isolating properties, and adapted to different boundary conditions for each direction. A build-up upon attainment of a resonant frequency of one of the two spring elements is moreover avoidable.

When, from at least one specific characteristic quantity of an operating parameter on, in addition to at least one first spring element at least one second spring element of the isolating apparatus comes into effective connection, a resultant characteristic curve of spring may be designed particularly flexibly and with inexpensive standard spring elements for various types of application. This may be achieved in a constructionally simple manner in that, from at least one specific force introduced in the direction of motion of the gripping element on and/or from a specific spring excursion of the first spring element on, in addition to the first spring element the second spring element comes into abutment. It is however also possible for more or less spring elements to come into effective connection exclusively in dependence upon a position of the hand tool machine. This may be realized e.g. by a tilting mechanism, which utilizes gravitational force and with which in a horizontal position of the hand tool machine either a spring element and/or a bearing surface tilts into a first corresponding position, so that the spring element is deflected by a force introduced at the gripping element, and with which in a vertically downward position of the hand tool machine the spring element and/or the bearing surface tilts into a second corresponding position, so that a

deflection of the spring element by a force introduced at the gripping element is avoided. Besides the described mechanisms, further mechanisms deemed meaningful by the person skilled in the art are conceivable.

Further advantages arise from the following description of the drawings. Embodiments of the invention are illustrated in the drawings. The drawings, the description and the claims contain numerous features in combination. The person skilled in the art will advantageously consider the features also individually and combine them into meaningful further combinations.

The drawings show:

Fig. 1 a drilling and chisel hammer having a pivotally mounted additional handle according to the invention,

Fig. 2 an enlarged cutout II from Fig. 1 with an isolating apparatus of the additional handle,

Fig. 3 a section along the line III-III in Fig. 2,

Fig. 4 a variant of the embodiment of Fig. 1 with a bow-type handle,

Fig. 5 a side view of the bow-type handle of Fig. 4,

Fig. 6 a drilling and chisel hammer with a partial section through an isolating apparatus of an additional handle guided in a translatory manner,

Fig. 7 a partial section through an alternative isolating apparatus to Fig. 6 with a multi-stage spring unit,

Fig. 8 a variant of the embodiment of Fig. 6 with a bow-type handle and

Fig. 9 a side view of the bow-type handle of Fig. 8 with a partial section through its isolating apparatus.

Fig. 1 shows a drilling and chisel hammer 18 having an electric motor, which is disposed in a housing 26 and is not shown in detail. By means of the electric motor a tool, which is clampable in a toolholder 52 and is not shown in detail,

may be set in rotation via a gear unit and driven percussively via an impact mechanism. Disposed on an end of the housing 26 remote from the toolholder 52 is a main handle 54, which is connected to the housing 26 by an isolating apparatus 56.

In machining direction 42 upstream of the toolholder 52 there is formed in a front region of the housing 26 a collar 58, to which an additional handle having a gripping element 10 is fastened by a band clamp 60.

The additional handle in the form of a haft handle is connected by an isolating apparatus 20 to the housing 26 of the drilling and chisel hammer 18 (Figs. 1 and 2).

The isolating apparatus 20 comprises a bearing unit 28 having a torsion spring designed as bearing pin 36, about which the gripping element is pivotally supported and guided in machining direction 42. The bearing unit 28 is disposed between the gripping element 10 and the housing 26. The bearing pin 36 is supported in a U-shaped location region 62 of a web-like extension 64, which extends radially relative to the housing 26, of the band clamp 60 by its first end 66 in a first limb 68 of the location region 62 in a rotationally fixed manner and by its second end 70 in a second limb 72 of the location region 62 in a rotatable manner (Fig. 3). The bearing pin 36 extends through a bearing bore 74 of the gripping element 10 and is connected at its side directed towards the second end 70 by a sub-section in a rotationally fixed manner to the bearing pin 36.

When chiselling and/or drilling, a user guides the drilling and chisel hammer 18 at the main handle 54 and at the vibration-isolated gripping element 10 of the additional handle in machining direction 42 against a surface to be machined, wherein the additional handle for vibration isolation may be pivotally deflected counter to a spring force of the torsion spring designed as bearing pin 36.

The isolating apparatus 20 further comprises a helical compression spring 46, which is fastened by its end remote from the machining direction 42 in the location region 62 of the band clamp 60. From a specific characteristic quantity on and/or from a specific force introduced by the user at the additional handle in machining direction 42 on, the helical compression spring 46 comes with its end pointing in machining direction 42 into abutment with a lug 76 formed on the gripping element 10. The spring forces of the torsion spring and the helical compression spring 46 are added together and an, as a whole, increased spring stiffness is achieved (Fig. 2).

Further embodiments of the invention are illustrated in Figs. 4 to 9. In the illustrated embodiments components remaining substantially identical are in principle provided with identical reference characters. Furthermore, with regard to features and functions, which remain identical, reference may be made to the description pertaining to the embodiment in Figs. 1 to 3. The following description is substantially confined to the differences from the embodiment in Figs. 1 to 3.

Figs. 4 and 5 show an additional handle in the form of a bow-type handle, wherein the bow-type handle is connected to a housing 26 of a drilling and chisel hammer 18 by an isolating apparatus 20, which corresponds to the embodiment in Figs. 1 to 3. The bow-type handle is supported so as to be rotatable about its longitudinal axis in front of and behind its gripping element 12 in longitudinal direction of the latter in each case in a bearing unit 84, 86.

Fig. 6 shows an additional handle in the form of a haft handle of a drilling and chisel hammer 18 with an isolating apparatus 22. The additional handle is connected by the isolating apparatus 22 and by a web-like extension 78 of a band clamp 80 to a housing 26 of the drilling and chisel hammer 18, wherein the extension 78 extends radially relative to the housing 26.

The isolating apparatus 22 comprises a bearing unit 30, by means of which a gripping element 14 of the additional handle is guided in a translatory manner in machining direction 42.

The bearing unit 30, which is sealed by sealing elements not shown in detail, comprises a guide rail 38 and a slide 40, which is guided in the guide rail 38 and to which the gripping element 14 is fastened.

The gripping element 14 is guideable by the slide 40 in the bearing unit 30 in machining direction 42 towards a helical compression spring 48 (Fig. 6). The helical compression spring 48 is supported by its front end pointing in machining direction 42 against a wall of the guide rail 38, which is closed in machining direction 42, and acts with its rear end counter to machining direction 42 upon the slide 40. The wall of the guide rail 38 pointing in machining direction 42 serves as an end stop 44 for the slide 40 guided in the guide rail 38. In the opposite direction to machining direction 42 the guide rail 38 has a stop 82 made of elastic rubber, which is fastened to a wall of the guide rail 38, which is closed counter to machining direction 42, and has a vibration-isolating effect. The helical compression spring 48, which is biased in the idle state, presses the slide 40 with a side remote from machining direction 42 counter to machining direction 42 against the stop 82 (Fig. 6).

When a user guides the drilling and chisel hammer 18 at a main handle 54 and at the gripping element 14 of the additional handle against a surface to be machined, by virtue of the force of application of the user the gripping element 14 is deflected by the slide 40 in machining direction 42 counter to a spring force of the helical compression spring 48. With the translatory movement of the gripping element 14 at a constant distance from a machining axis of the drilling and chisel hammer 18 the gripping element 14 is isolated in axial direction from the housing 26, and the isolating apparatus 22 acts in a vibration-isolating manner between the housing 26 and the gripping element 14 (Fig. 6).

Fig. 7 shows an alternative additional handle to Fig. 6 with an isolating apparatus 20', in which in addition to a first helical compression spring 48 a second helical compression spring 50 is disposed in a guide rail 38. The second helical compression spring 50 is fastened by its end pointing in machining direction 42 to a wall of the guide rail 38 and, from a specific characteristic quantity on and/or from a specific force introduced by the user at the additional handle in machining direction 42 on, comes with its end pointing counter to machining direction 42 into abutment with a slide 40, which is guided in the guide rail 38.

When work is being carried out with the drilling and chisel hammer 18 in a horizontal operating position, the gravitational force of the drilling and chisel hammer 18 acts at right angles to the machining direction 42, and a user has to introduce at the gripping element 14 a higher actuating force in machining direction 42 than in the case of a vertically downward operating position. By virtue of the introduction of a higher actuating force the first helical compression spring 48 is compressed to such an extent that the slide 40 comes into abutment with the second helical compression spring 50. The spring forces of the first and the second helical compression spring 48, 50 add up to an advantageous spring force for a horizontal operating position. The spring action and/or isolating effect is therefore maintained even in the event of extreme application pressure. In vertically downward operating positions, in horizontal operating positions and in vertically upward operating positions, an isolating range advantageously designed for the appropriate position always arises.

Figs. 8 and 9 show an additional handle in the form of a bow-type handle of a drilling and chisel hammer 18 with an isolating apparatus 24. The isolating apparatus 24 comprises two bearing units 32, 34, which in their function and construction correspond to the bearing unit 30 of the isolating apparatus 22 in Fig. 6. In longitudinal direction of the gripping element 16 there is disposed in front of

the gripping element 16 the bearing unit 32 and behind the gripping element 14 the bearing unit 34 of the isolating apparatus 22 (Fig. 9).

Claims

1. Additional handle for a hand tool machine (18), having at least one gripping element (10, 12, 14, 16), which is connectable by an isolating apparatus (20, 22, 24) for vibration isolation to a housing (26) of the hand tool machine (18), characterized in that the isolating apparatus (20, 22, 24) comprises at least one bearing unit (28, 30, 32, 34), by means of which the gripping element (10, 12, 14, 16) is guided in at least one direction.

2. Additional handle according to claim 1, characterized in that the bearing unit (28) comprises at least one bearing pin (36), about which the gripping element (10, 12) is capable of swivelling.

3. Additional handle according to claim 2, characterized in that the isolating apparatus (20) for vibration isolation of the gripping element (10, 12) comprises at least one torsion spring.

4. Additional handle according to one the preceding claims, characterized in that the gripping element (12) is supported so as to be rotatable about its longitudinal axis.

5. Additional handle according to claim 1, characterized in that the gripping element (14, 16) is guided in a translatory manner in at least one direction by the bearing unit (30, 32, 34).

6. Additional handle according to claim 5, characterized in that the bearing unit (30, 32, 34) for guiding the gripping element (14, 16) comprises at least one slide (40), which is guided in a guide rail (38).

7. Additional handle according to claim 6, characterized in that the slide (40) in the guide rail (38) is restricted in machining direction (42) by an end stop (44).

8. Additional handle according to claim 6 or 7, characterized in that the guide rail (38) is externally sealed by means of at least one sealing element.

9. Additional handle according to one of claims 5 to 8, characterized in that the gripping element (14, 16) is guided in machining direction (42) by the bearing unit (30, 32, 34).

10. Additional handle according to one of claims 5 to 9, characterized in that disposed in front of and behind the gripping element (16) in longitudinal direction of the latter is a bearing unit (32, 34) of the isolating apparatus (24).

11. Additional handle according to one of the preceding claims, characterized in that the isolating apparatus (20, 22, 24) comprises at least one helical compression spring (46, 48, 50).

12. Additional handle according to one of the preceding claims, characterized in that, from at least one specific characteristic quantity of an operating parameter on, in addition to at least one first spring element (36, 48) at least one second spring element (46, 50) of the isolating apparatus (20, 22') comes into effective connection.

13. Hand tool machine having an additional handle according to one of the preceding claims.

14. Additional handle substantially as herein described with reference to the accompanying drawings.

15. Hand tool machine substantially as herein described with reference to the accompanying drawings.

Application No: GB 0214312.1 /4 **Examiner:** Robert Black
Claims searched: 1-15 **Date of search:** 10 October 2002

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.T): B4K KSM

Int Cl (Ed.7): B25G 1/01, 1/02; B25F 5/02

Other: Online: EPODOC; WPI; PAJ

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2297514 A	(BOSCH) see especially figure 1 and abstract	1 and 11
X	WO 95/21039 A1	(MISAILESCU) see especially figure 1	1, 5 and 9-12
X	DE 4104917 A	(GERLACH) see especially figures 1-3 and WPI abstract 1992-285563	1, 5 and 9-11
X	DE 2804223 A	(METABOWERKE) see especially the figures and WPI abstract 1979-H5560B	1
X	US 5749421 A	(JOHANSSON) see especially figure 3 and column 2 line 65 to column 3 line 14	1 and 11

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.